

Original article

Determination of normative reference for the definition of sarcopenia among Filipinos

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Received 23 June 2016; revised 13 July 2016; accepted 20 July 2016

Available online 23 August 2016

Abstract

Background: At present, there is no normative value that can be used in the definition of sarcopenia in the Philippines.

Objective: We identified the reference cut-off values for: 1) muscle mass using bioimpedance analysis; 2) grip strength; 3) usual gait speed; 4) timed get-up-and-go; and 5) short physical performance battery in the Philippines in order to adapt the European Working Group on Sarcopenia in Older People (EWGSOP) criteria for the definition of sarcopenia.

Methods: Two hundred seventy six (135 males and 141 females) healthy Filipino adults, between 20 and 40 years, were included in this cross sectional study. A Fresenius Body Composition Monitor was used to measure lean tissue mass (LTM) and lean tissue index (LTI). A dynamometer was used to measure grip strength. Usual gait speed, timed get-up-and-go, and short physical performance battery were also determined.

Result: The normative references for males and females, respectively, for LTI were $17.10 + 2.337 \text{ kg/m}^2$ and $12.63 + 2.119 \text{ kg/m}^2$; for usual gait speed were $1.06 + 0.251 \text{ m/sec}$ and $0.930 + 0.144 \text{ m/sec}$; and for grip strength were $39.76 + 7.567 \text{ kg}$ and $26.68 + 5.243 \text{ kg}$. The sarcopenia cut-points for the males and females, respectively, for LTI were $<12.50 \text{ kg/m}^2$ and $<8.33 \text{ kg/m}^2$; for usual gait speed were $<0.55 \text{ m/sec}$ and $<0.65 \text{ m/sec}$; and for grip strength were $<24.54 \text{ kg}$ and $<16.10 \text{ kg}$.

Conclusion: This study presents cut-points for the determination of sarcopenia at-risk population among Filipinos.

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Keywords: Impedance; Anthropometry; Sarcopenia

1. Introduction

The aging of world population has been identified as a key concern that the U.N. Population Fund created Global AgeWatch Index [1] to address the dearth of international data on the extent and impact of global aging. In the Philippines, life expectancy at 60 years old is pegged at 17 years, while healthy life expectancy at 60 years old is at 14

years [2]. The four-year difference between life expectancy and healthy life expectancy at 60 years old, therefore, poses a challenge in the formulation of national policies that will close the gap and ensure healthy life among those 60 years old and above.

The last decade saw a rapid increase in the number of elderly Filipinos from 4.6 million senior citizens or about 6% of the total population in the year 2000 to 6.5 million or about 6.9% of the total population in 2010 [3]. With an increasing number of Filipinos 60 years old and above, old age-related illnesses and morbidities will become major concerns in the delivery of health care. Thus, efforts to prevent illnesses associated with advanced age can be a major strategy in health care delivery savings.

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Peer review under responsibility of The Korean Society of Osteoporosis.

One of the most important age-related conditions that lead to decreased functional capacity and physical disability among older people is sarcopenia. It is a syndrome characterized by progressive and generalized loss of skeletal muscle mass and strength [4]. The impact of sarcopenia has been quantified in a number of studies on morbidity [5], disability [6], high costs of health care [7], and mortality [8]. Several studies have shown that poor strength, function, and low muscle density are linked to hospitalization in elderly [9]. Physical activity and total energy expenditure have been significantly correlated with dementia [10]. Alzheimer pathology has also been linked to lower body weight [11].

While sarcopenia is a syndrome associated with older-age individuals, the condition is a relatively young field of study. In fact, it was only in 2009 that the European Union Geriatric Medicine Society (EUGMS) created the European Working Group on Sarcopenia in Older People (EWGSOP) to propose the measurement tools, standard parameters, and variables that can be used to establish its diagnosis [4]. In their 2010 consensus report, EWGSOP defined sarcopenia as low muscle mass and either low muscle strength or low physical performance.

In Asia, sarcopenia's impact is reckoned to be vast because the region is rapidly aging with a huge population [12]. Hence, the Asian Working Group for Sarcopenia (AWGS) endeavors to promote sarcopenia research. Over the last few years, it has gathered the finest existing evidences from the countries in the region to determine the consensus for sarcopenia diagnosis. In its 2014 consensus report, the AWGS has concurred with the previous reports that sarcopenia should be defined as low muscle mass plus low muscle strength and/or low physical performance [12].

Several techniques have been validated for the identification of sarcopenia. These include computed tomography, magnetic resonance imaging, dual X-ray absorptiometry, bioimpedance analysis (BIA), and total and partial body potassium per fat free soft tissue. Among these, it is the BIA that carries the double advantage of accuracy and portability. It estimates the volume of fat and lean body mass. The test itself is inexpensive, easy to use, readily reproducible, and appropriate for both ambulatory and bedridden patients. The BIA measurement techniques, used under standard conditions, have been studied for more than 10 years [13].

Muscle strength measurement can also be accomplished using various techniques. These include anthropometric measures, handgrip strength, short physical performance battery, usual gait speed, and timed get-up-and-go test. In all these studies, the reference value for determining the abnormal can be a limitation.

Different measurement techniques require the availability of a reference value. EWGSOP advocates the use of normative (healthy young adult) rather than other predictive reference populations. The cut-off points recommended is two standard deviations below the mean reference value. It also notes the urgent need to obtain good reference values for populations around the world. In Asia, due to its huge populace and diverse ethnicities, selecting appropriate diagnostic cut-off values for all the measurements has been a challenge [12].

In defining sarcopenia, EWGSOP recommends the use of normative data derived from the study population rather than using other population. This recommendation reflects the understanding that body composition may be affected by race and environmental factors like food variety and physical activity. To date, there is no available Philippine normative value that can be used to diagnose sarcopenia.

This paper aimed to establish the normal muscle mass and physical performance in the Filipino population in order to improve the applicability of the EWGSOP criteria. The cut-off values to be used in determining at-risk population among the elderly were then identified. This study used BIA, anthropometric measurements, isometric hand grip to measure muscle strength gait speed, timed get-up-and-go test, and functional independence measure to establish the standards, in accordance with the EWGSOP recommendations.

2. Materials and methods

2.1. Population and sampling

This cross sectional study examined 276 healthy adults, 135 male and 141 female subjects, in the age range of 20–40 years. The sample size computation was based on the paper of C. Jennen-Steinmetz and S. Wellek titled “A new approach to sample size calculation for reference interval studies.” Stratified sampling was used based on age and sex proportionate to the 2015 age-sex distribution published by the National Statistical Coordination Board (NSCB) in the National Statistics Office (NSO) website. Subjects were recruited among the students, faculty and staff of the University of the Philippines Manila (UPM), including doctors, nurses, allied health professionals, technicians, and maintenance personnel.

This sampling was predicated on the assumption that healthy members of the UPM community aged 20–40 years can adequately represent the population of the country, for a tolerable limit of 3.7% and fixed probability of 90% for a 95% reference interval (two-sided). This was sufficient since the study used a one-sided interval. Subjects were excluded if they: 1) had any physical impairment that prevented them from performing the required physical tests; 2) were unable to follow instructions; or 3) had BMI <18.5 or >29.9.

This study was approved by the Departmental Technical Review Board and University of the Philippines Manila Research Ethics Board. Considering the lack of biosafety concern in studies such as this, no further clearance was obtained from a biosafety committee. Informed consent forms duly approved by the institutional ethics review board were taken from all subjects. Participants were interviewed and examined to obtain relevant demographic and health information.

2.2. Data collection procedures

2.2.1. Muscle mass

This study used the Fresenius Body Composition Monitor to determine lean tissue mass and lean tissue index. Standard manufacturer protocol was followed.

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